

Docket No.: 49657-844

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of

Akira OHTA, *et al.*

Serial No.: 09/717,215

Filed: November 22, 2000



Group Art Unit: 2817

Examiner: Joseph Chang

For: HIGH EFFICIENCY AMPLIFIER WITH AMPLIFIER ELEMENT, RADIO TRANSMISSION
DEVICE THEREWITH AND MEASURING DEVICE THEREFOR

APPEAL BRIEF

Commissioner for Patents
Washington, DC 20231

Sir:

This Appeal Brief is submitted in support of the Notice of Appeal filed January 6, 2003.

I. REAL PARTY IN INTEREST

The real party in interest is Mitsubishi Denki Kabushiki Kaisha, the assignee of the entire right,
title and interest in and to the above-identified U. S. Application.

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II. RELATED APPEALS AND INTERFERENCES

No other appeals or interferences are known to the Appellant, which will directly affect or be
directly affected by or have a bearing on the Board's decision in the pending appeal.

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III. STATUS OF CLAIMS

Claims 1-67 are pending in the application. Claims 7, 9-32, 39 and 41-67 are withdrawn from consideration. Claims 1-6, 8, 33-38 and 40 stand under final rejection, from which rejection this appeal is taken.

IV. STATUS OF AMENDMENTS

The application has not been amended after the final Office Action.

V. SUMMARY OF INVENTION

The present invention relates to a high efficiency amplifier that may be used in a communication device, such as a radio transmission device. As shown in FIG. 1 of the application, a radio transmission device 1100 of the present invention includes a high efficiency amplifier 1A, a non-reciprocal circuit element 3A, such as an isolator, and a transmission line 2 between the amplifier 1A and the non-reciprocal element 3A. The output of the non-reciprocal circuit element 3A may be connected to an antenna. The output impedance of the amplifier 1A is less than a standard value equal to 50 Ohm. The input impedance of the non-reciprocal element 3A is less than the standard value, and its output impedance is substantially equal to the standard value.

The high efficiency amplifier 1A has an input terminal Z0 and an output terminal Z1. An amplifier element, which may be composed of a first-stage amplifier 105 and a second-stage amplifier 107, is arranged between the input and the output terminals for amplifying an input signal supplied to the input terminal Z0. At least one harmonic processing circuit 5 is provided between the amplifier

element and the output terminal Z1 to process a harmonic in an output signal of the amplifier element. An embodiment of the present invention in FIG. 10 has two harmonic processing circuits 5 and 10 between the amplifier element and the output terminal.

As discussed in the background section of the specification, the high efficiency amplifier of the present invention does not contain a fundamental wave matching circuit arranged in conventional amplifiers. For example, a conventional amplifier illustrated in FIG. 35 has a fundamental wave matching circuit 112 that converts the output impedance of the amplifier to the 50 Ohm standard value. However, the fundamental wave matching circuit causes substantial power loss and, therefore, reduces efficiency of the amplifier. Hence, it is desirable to exclude the fundamental wave matching circuit from an amplifier.

However, if the output of an amplifier without a fundamental wave matching circuit is connected to impedance of 50 Ohm or less, leakage power associated with harmonic components of the amplified signal increases. In order to address this problem, the amplifier of the present invention includes at least one harmonic processing circuit that reduces harmonic-related leakage power.

As described, for example, on page 22 of the specification, the harmonic processing circuit may be configured to match impedance of the harmonic component and to suppress the harmonic-related leakage power. This circuit may serve as a short-circuit load with sufficiently low impedance for a higher-order harmonic. Alternatively, the harmonic processing circuit may be formed as an open-circuit load with sufficiently high impedance for a higher-order harmonic.

Further, the high efficiency amplifier of the present invention may further include a fundamental wave regulator circuit, such as a circuit 6 in FIG. 1. As described on page 23 of the specification, this circuit may perform fine adjustment of the impedance for the fundamental wave in the amplified signal.

VI. ISSUES

Whether claims 1-6, 8, 33-38 and 40 are anticipated by Makino *et al.* (5,945,887) under 35 U.S.C. § 102.

VII. GROUPING OF CLAIMS

Appellant submits that the claims of the rejected group do not stand or fall together. The claims being considered to be separately patentable for the reasons presented in the Argument section of this Brief.

VIII. THE ARGUMENT

Anticipation, under 35 U.S.C. § 102, requires that each element of a claim in issue be found, either expressly described or under principles of inherency, in a single prior art reference. *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 USPQ 781 (Fed. Cir. 1983); *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 9 USPQ2d 1920 (Fed. Cir. 1989) *cert. denied*, 110 S.Ct. 154 (1989). The term "anticipation," in the sense of 35 U.S.C. 102, has acquired the accepted definition meaning "the disclosure in the prior art of a thing substantially identical with the claimed invention." *In re Schaumann*, 572 F.2d 312, 197 USPQ 5 (CCPA 1978). The initial burden of establishing a basis for denying patentability to a claimed invention rests upon the Examiner. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Thorpe*, 777 F.2d 695, 227 USPQ 964 (Fed. Cir. 1985); *In re*

Piasecki, 745 F.2d 1468, 223 USPQ 785 (Fed. Cir. 1984). To satisfy this burden, therefore, each and every element of the claimed invention must be shown by the Examiner to be disclosed in Makino *et al.* Appellant respectfully asserts that the record fails to meet this requirement.

In particular, claim 1 recites a high efficiency amplifier, connected to a non-reciprocal circuit element having an input impedance lower than a standard impedance and an output impedance substantially equal to said standard impedance. The amplifier comprises:

- an input terminal to receive an input signal;
- an output terminal connected to said non-reciprocal circuit element;
- an amplifier element to amplify said input signal; and
- one or a plurality of harmonic processing circuits arranged between said amplifier element and said output terminal to process a harmonic in an output signal of said amplifier element.

Independent claim 33, among other elements, also recites a high efficiency amplifier including:

- an input terminal to receive an input signal,
- an output terminal connected to the non-reciprocal circuit element via the transmission line,
- an amplifier element to amplify the input signal, and
- one or a plurality of harmonic processing circuits arranged between the amplifier element and the output terminal to process a harmonic in an output signal of the amplifier element.

In the final Office Action of September 5, 2002 and the Advisory Action of December 20, 2002, the Examiner pointed out that the harmonic processing circuit corresponds to circuit 6 or 16 in figure 2 of Makino, which is between the amplifier 13 and the output terminal (50ohms terminal).

The Examiner further asserts that the term "harmonic processing circuit" used in the claims "is properly read, in the broadest reasonable interpretation, as a processing circuit that performs filtering harmonics or matching impedance of harmonics of signal of interest."

First, it is noted that the Examiner's "broadest reasonable interpretation" of the term "harmonic processing circuit" is incorrect. It is respectfully submitted that one skilled in the art would interpret the "harmonic processing circuit" as a circuit for processing a harmonic in a signal.

Further, as demonstrated below neither circuit 6 nor circuit 16 of Makino *et al.* anticipates a harmonic processing circuit arranged between an amplifier element of an amplifier and an output terminal of the amplifier, as independent claims 1 and 33 require.

Considering Makino *et al.*, FIG. 2 of the reference shows an amplifier 10 coupled to an isolator 1. The patent specifically indicates that "impedance conversion circuit 6 is integrally incorporated within isolator 1" (col. 4, lines 28-30). Further, the reference discloses that "in isolator 1 of the present embodiment, an impedance conversion circuit 6 is added to port P1." (col. 4, lines 46-47).

Accordingly, the impedance conversion circuit 6 is provided in the isolator 1, rather than between the amplifier element and the output terminal of the amplifier, as claims 1 and 33 require.

The Examiner erroneously considers the 50-ohm output of the isolator 1 to correspond to the claimed output terminal. However, claims 1 and 33 specifically recite that the claimed output terminal is an element of the high efficiency amplifier connected to a non-reciprocal circuit element.

Inasmuch as the impedance conversion circuit 6 is not arranged between the amplifier element and the output terminal of the amplifier, this circuit does not anticipate the claimed harmonic processing circuit arranged between the amplifier element and the output terminal of the amplifier to process a harmonic in an output signal of the amplifier element.

Moreover, the Makino *et al.* patent emphasizes that the disclosed invention is directed to a non-reciprocal circuit device, such as an isolator (col. 2, lines 33-37). The impedance conversion circuit 6 is integrated into the isolator 1 to match the input impedance of the isolator 1 with low output impedance of the amplifier 10. Hence, the reference is not concerned with addressing problems

relating to an amplifier. Instead, it addresses problems relating to a non-reciprocal element to be connected to an amplifier.

By contrast, the claimed harmonic processing circuit is incorporated into an amplifier to effectively reduce the harmonic-related leakage power at the output of the amplifier. To address this problem, the harmonic processing circuit should be provided as close as possible to an active element used for amplifying signals in order to increase reflectance of harmonics in the output signal of that active element. The increased reflectance of the harmonics makes it possible to achieve harmonic processing corresponding to processing by class-F amplifier or inverse class-F amplifier. As a result, the efficiency of the amplifier is improved.

Accordingly, the impedance conversion circuit 6 of Makino *et al.* does not anticipate the claimed harmonic processing circuit arranged between an amplifier element of an amplifier and an output terminal of the amplifier, as independent claims 1 and 33 require.

Further, Makino *et al.* discloses that the output matching circuit 16 having an output impedance of 2 to 12.5 Ohms "removes the reactance component only" (column 4, lines 55-56). The reference does not teach or suggest that the output matching circuit 16 processes a harmonic in the output signal of the amplifier. Accordingly, Makino *et al.* does not expressly disclose that the output matching circuit 16 is a harmonic processing circuit.

In the event the Examiner relied upon inherency without expressly indicating such reliance, the Examiner should be aware that inherency requires certainty, not speculation. *In re Rijckaert*, 9 F.3d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993); *In re King*, 801 F.2d 1324, 231 USPQ 136 (Fed. Cir. 1986); *W. L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983); *In re Oelrich*, 666 F.2d 578, 212 USPQ 323 (CCPA 1981); *In re Wilding*, 535 F.2d 631, 190 USPQ 59 (CCPA 1976). To establish inherency, the extrinsic evidence must make clear that the missing

descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probability or possibilities. *In re Robertson*, 169 F.3d 743, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999).

However, the Examiner provided no factual basis upon which to conclude that the output matching circuit 16 processes a harmonic in the output signal of the amplifier.

Moreover, one skilled in the art would realize from the Makino disclosure that in order to remove the reactance component, the output matching circuit 16 does not need to process a harmonic. The reactance component is usually eliminated to provide impedance matching for a fundamental wave. Therefore, the output matching circuit 16 may perform impedance conversion only for a fundamental wave. It is noted that the term "harmonic" relates to a signal component having a frequency that is an integral multiple of the fundamental frequency.

Accordingly, the reference provides no reason for one skilled in the art to conclude that the output matching circuit 16 processes a harmonic in the amplified signal. Hence, Makino *et al.* does not anticipate the invention recited in independent claims 1 and 33 even under principles of inherency.

Thus, neither circuit 6 nor circuit 16 of Makino is a harmonic processing circuit arranged between an amplifier element of an amplifier and an output terminal of the amplifier, as independent claims 1 and 33 require.

Therefore, Makino *et al.* does not describe the invention recited in independent claims 1 and 33 within the meaning of 35 U.S.C. § 102.

Moreover, it is submitted that Makino *et al.* does not disclose the subject matter of dependent claims 3-6, 8, 35-38 and 40.

In particular, the reference does not disclose a harmonic processing circuit that :

- matches impedance of the processed harmonic, as claims 3 and 35 require;
- suppresses harmonic-related power leakage caused by the processed harmonic, as claims 4 and 36 require;

- serves as an open circuit load to the harmonic, as claims 5 and 37 require; or
- serves as a short circuit load to the harmonic, as claims 6 and 38, require.

Further, Makino *et al.* does not disclose a fundamental wave regulator circuit between the amplifier element and the output terminal to perform a fine adjustment of an impedance of a fundamental wave in an output signal of the amplifier element, as claims 8 and 40 recite.

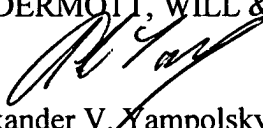
The Examiner asserts that the output matching circuit 6 inherently performs the above-described functions. However, he provided no evidence to support his assertion. Accordingly, the Examiner's conclusion of anticipation with respect to dependent claims 3-6, 8, 35-38 and 40 is improper.

IX. CONCLUSION

For the reasons advanced above, Appellant respectfully contends that the rejection of claims 1-6, 8, 33-38 and 40 as being anticipated by Makino *et al.* under 35 U.S.C. § 102 is improper as the Examiner has not met the burden of establishing a prima facie case of anticipation. Reversal of the rejection in this appeal is respectfully requested.

Respectfully submitted,

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APPENDIX

1. A high efficiency amplifier, connected to a non-reciprocal circuit element having an input impedance lower than a standard impedance and an output impedance substantially equal to said standard impedance, comprising:

an input terminal to receive an input signal;

an output terminal connected to said non-reciprocal circuit element;

an amplifier element to amplify said input signal; and

one or a plurality of harmonic processing circuits arranged between said amplifier element and said output terminal to process a harmonic in an output signal of said amplifier element.

2. The high efficiency amplifier according to claim 1, wherein

said standard impedance is 50 ohm and

an output impedance at said output terminal is substantially in the range from 3 ohm to 30 ohm.

3. The high efficiency amplifier according to claim 2, wherein

at least one of said one or plurality of harmonic processing circuits matches impedance of said harmonic.

4. The high efficiency amplifier according to claim 2, wherein

at least one of said one or plurality of harmonic processing circuits suppresses harmonic-related power leakage caused by said harmonic.

5. The high efficiency amplifier according to claim 2, wherein
at least one of said one or plurality of harmonic processing circuits serves as an open circuit
load to said harmonic.
6. The high efficiency amplifier according to claim 2, wherein
at least one of said one or plurality of harmonic processing circuits serves as a short circuit load
to said harmonic.
8. The high efficiency amplifier according to claim 1, further comprising
a fundamental wave regulator circuit between said amplifier element and said output terminal to
perform a fine adjustment of an impedance of a fundamental wave in an output signal of said amplifier
element.
33. A radio transmission device, comprising:
a high efficiency amplifier having an output impedance lower than a standard impedance;
a non-reciprocal circuit element having an input impedance lower than said standard impedance
and an output impedance substantially equal to said standard impedance and
a transmission line to connect said high efficiency amplifier and said non-reciprocal circuit
element;
said high efficiency amplifier including
an input terminal to receive an input signal,
an output terminal connected to said non-reciprocal circuit element via said transmission line,

an amplifier element to amplify said input signal, and

one or a plurality of harmonic processing circuits arranged between said amplifier element and said output terminal to process a harmonic in an output signal of said amplifier element.

34. The radio transmission device according to claim 33, wherein

said standard impedance is 50 ohm and

an output impedance in said high efficiency amplifier is substantially in the range from 3 ohm to 30 ohm.

35. The radio transmission device according to claim 34, wherein

at least one of said one or plurality of harmonic processing circuits matches impedance of said harmonic.

36. The radio transmission device according to claim 34, wherein

at least one of said one or plurality of harmonic processing circuits suppresses harmonic-related power leakage caused by said harmonic.

37. The radio transmission device according to claim 34, wherein

at least one of said one or plurality of harmonic processing circuits serves as an open circuit load to said harmonic.

38. The radio transmission device according to claim 34, wherein

at least one of said one or plurality of harmonic processing circuits serves as a short circuit load

to said harmonic.

40. The radio transmission device according to claim 33, wherein said high efficiency amplifier further includes,

a fundamental wave regulator circuit between said amplifier element and said output terminal to perform a fine adjustment of an impedance of a fundamental wave in an output signal of said amplifier element.